

WHAT IS CLAIMED IS:

1           1. A multicolor display comprising

2           a substrate; and

3           at least one multicolor generation site coupled to said substrate, each of

4           said at least one multicolor generation sites comprised of:

5           at least two light emitting regions proximate to one another; and

6           at least one wavelength conversion layer applied to at least one of

7           said at least two light emitting regions, wherein said at least two light emitting

8           regions in combination with said at least one wavelength conversion layer emit at

9           least two different colors.

1           2. A multicolor display comprising

2           a substrate; and

3           a multicolor generation site grown on said substrate comprising:

4           at least two LEDs proximate to one another; and

5           a first wavelength conversion layer applied to a light emitting

6           surface of a first of said at least two LEDs, wherein said at least two LEDs in

7           combination with said first wavelength conversion layer emit at least two different

8           colors.

1           3. The multicolor display of claim 2, wherein said at least two LEDs

2           are comprised of three individual LEDs proximate to one another.

1           4. The multicolor display of claim 3, further comprised of a second

2           wavelength conversion layer applied to a light emitting surface of a second of said three

3           individual LEDs, wherein said three individual LEDs in combination with said first and

4           second wavelength conversion layers emit three different colors.

1           5. The multicolor display of claim 2, wherein said at least two LEDs

2           emit light at a wavelength in the range of wavelengths between 4,000 and 4,912

3           Angstroms.

1           6. A multicolor display comprising

2                   a substrate; and  
3                   a plurality of multicolor generation sites grown on said substrate, each of  
4    said plurality of multicolor generation sites comprised of:  
5                   at least two LEDs proximate to one another; and  
6                   a wavelength conversion layer deposited on a light emitting surface  
7    of a first of said at least two LEDs, wherein said at least two LEDs in combination  
8    with said wavelength conversion layer emit at least two different colors.

1                 7.    The multicolor display of claim 6, further comprising an index  
2    matching layer interposed between said wavelength conversion layer and said light  
3    emitting surface of said first LED.

1                 8.    The multicolor display of claim 6, further comprising a protective  
2    layer deposited on an exterior surface of said wavelength conversion layer.

1                 9.    The multicolor display of claim 6, further comprising a protective  
2    layer deposited on a light emitting surface of a second of said at least two LEDs.

1                 10.   The multicolor display of claim 6, further comprising a region of  
2    opaque material deposited between said at least two LEDs.

1                 11.   The multicolor display of claim 6, wherein said substrate is  
2    selected from the group consisting of sapphire, silicon carbide and gallium nitride.

1                 12.   The multicolor display of claim 6, wherein said at least two LEDs  
2    emit light at a wavelength in the range of wavelengths between 4,000 and 4,912  
3    Angstroms.

1                 13.   The multicolor display of claim 6, further comprising a cross-talk  
2    minimization layer interposed between said substrate and said at least two LEDs.

1                 14.   The multicolor display of claim 13, wherein said cross-talk  
2    minimization layer is comprised of a Bragg reflector.

1                 15.   The multicolor display of claim 13, wherein said cross-talk  
2    minimization layer is comprised of a partially absorbing layer.

1                 16.   A multicolor display comprising

2                   a substrate; and  
3                   a plurality of multicolor generation sites grown on said substrate, each of  
4    said plurality of multicolor generation sites comprised of:

5                   three LEDs proximate and immediately adjacent to one another;  
6                   a first wavelength conversion layer deposited on a light emitting  
7    surface of a first of said three LEDs; and  
8                   a second wavelength conversion layer deposited on a light emitting  
9    surface of a second of said three LEDs, wherein said three LEDs in combination  
10   with said first and second wavelength conversion layers emit three different  
11   wavelengths.

1                 17.    The multicolor display of claim 16, wherein said substrate is  
2    selected from the group consisting of sapphire, silicon carbide and gallium nitride.

1                 18.    The multicolor display of claim 16, wherein said first and second  
2    wavelength conversion layers are selected from the group of materials consisting of  
3    phosphors and active polymers.

1                 19.    The multicolor display of claim 16, wherein said three LEDs emit  
2    light at a wavelength in the range of wavelengths between 4,000 and 4,912 Angstroms.

1                 20.    The multicolor display of claim 16, wherein said first wavelength  
2    conversion layer converts light in a first wavelength range of between 4,000 and 4,912  
3    Angstroms to light in a second wavelength range of between 4,912 and 5,750 Angstroms.

1                 21.    The multicolor display of claim 16, wherein said second  
2    wavelength conversion layer converts light in a first wavelength range of between 4,000  
3    and 4,912 Angstroms to light in a second wavelength range of between 6,470 and 7,000  
4    Angstroms.

1                 22.    The multicolor display of claim 16, further comprising:  
2                   a first index matching layer interposed between said first wavelength  
3    conversion layer and said light emitting surface of said first LED; and  
4                   a second index matching layer interposed between said second wavelength  
5    conversion layer and said light emitting surface of said second LED.

1                   23.     The multicolor display of claim 16, further comprising:  
2                    a first protective layer deposited on an exterior surface of said first  
3 wavelength conversion layer; and  
4                    a second protective layer deposited on an exterior surface of said second  
5 wavelength conversion layer.

1                   24.     The multicolor display of claim 23, wherein said first and second  
2 protective layers are equivalent layers.

1                   25.     The multicolor display of claim 23, further comprising a third  
2 protective layer deposited on a light emitting surface of a third of said three LEDs.

1                   26.     The multicolor display of claim 16, further comprising a region of  
2 opaque material deposited between adjacent surfaces of said three LEDs.

1                   27.     The multicolor display of claim 16, further comprising:  
2                    a plurality of channels within said substrate, said plurality of channels  
3 separating adjacent LEDs of said three LEDs; and  
4                    opaque material deposited within said plurality of channels.

1                   28.     The multicolor display of claim 16, further comprising a cross-talk  
2 minimization layer interposed between said substrate and said at least two LEDs.

1                   29.     The multicolor display of claim 28, wherein said cross-talk  
2 minimization layer is comprised of a Bragg reflector.

1                   30.     The multicolor display of claim 28, wherein said cross-talk  
2 minimization layer is comprised of a partially absorbing layer.

1                   31.     A method of fabricating an active, multicolor display, comprising  
2 the steps of:  
3                    defining a plurality of multicolor generation sites on a single substrate;  
4                    growing at least two LEDs on said substrate at each of said plurality of  
5 multicolor generation sites; and  
6                    depositing a wavelength conversion layer on a light emitting surface of at  
7 least one of said at least two LEDs at each of said plurality of multicolor generation sites.

1           32. A method of fabricating an active, multicolor display, comprising  
2 the steps of:

3                 defining a plurality of multicolor generation sites on a single substrate;  
4                 growing three LEDs on said substrate at each of said plurality of  
5 multicolor generation sites;

6                 depositing a first wavelength conversion layer on a light emitting surface  
7 of a first of said three LEDs at each of said plurality of multicolor generation sites; and  
8                 depositing a second wavelength conversion layer on a light emitting  
9 surface of a second of said three LEDs at each of said plurality of multicolor generation  
10 sites.

1           33. The method of claim 32, further comprising the steps of:

2                 depositing a first index matching layer on said light emitting surface of  
3 said first of said three LEDs at each of said plurality of multicolor generation sites prior to  
4 depositing said first wavelength conversion layer; and

5                 depositing a second index matching layer on said light emitting surface of  
6 said second of said three LEDs at each of said plurality of multicolor generation sites  
7 prior to depositing said second wavelength conversion layer.

1           34. The method of claim 32, further comprising the steps of:

2                 depositing a first protective layer on an exterior surface of said first  
3 wavelength conversion layer; and

4                 depositing a second protective layer on an exterior surface of said second  
5 wavelength conversion layer.

1           35. The method of claim 34, further comprising the step of depositing  
2 a third protective layer on a light emitting surface of a third of said three LEDs at each of  
3 said plurality of multicolor generation sites.

1           36. The method of claim 32, further comprising the step of depositing  
2 an opaque material between a plurality of edge portions of said three LEDs at each of said  
3 plurality of multicolor generation sites.

1               37.     The method of claim 32, further comprising the step of interposing  
2     a cross-talk minimization layer between said substrate and said three LEDs at each of said  
3     plurality of multicolor generation sites.

1               38.     The method of claim 32, further comprising the step of interposing  
2     a distributed Bragg reflector between said substrate and said three LEDs at each of said  
3     plurality of multicolor generation sites.

1               39.     The method of claim 32, further comprising the step of selecting  
2     said first wavelength conversion layer to convert light in a first wavelength range of  
3     between 4,000 and 4,912 Angstroms to light in a second wavelength range of between  
4     4,912 and 5,750 Angstroms.

1               40.     The method of claim 32, further comprising the step of selecting  
2     said first wavelength conversion layer to convert light in a first wavelength range of  
3     between 4,000 and 4,912 Angstroms to light in a second wavelength range of between  
4     6,470 and 7,000 Angstroms.